tin or thick glue. Under favorable conditions this growth is extremely abundant and very conspicuous, filling the streams and pools with white or yellowish-white, thready, flocculent, firmly anchored, streaming masses, which are usually 3 to 5 cm. long, but which in small rapid brooks sometimes reach a length of 20 cm. The water of Yumoto is only very feebly acid, but contains a large amount of sulphide of hydrogen (about 0.04 grams per liter), and also considerable calcium bicarbonate (0.0624 grams per liter). Professor Miyoshi suggests that these organisms, the protoplasm of which must be endowed with great energy owing to the temperature at which it grows, oxidize the H_2S *directly* to H_2SO_4, which acid does not interfere with the life of the bacteria because it is quickly neutralized by the alkaline bicarbonate of the running water. A discussion of the morphology and physiology of these organisms is reserved for a subsequent paper, no opinion being ventured as to whether the gelatinous masses consist of one or of several species.

In the second part, the chemotropism of *Chromatium weissii* is discussed, and some new genera and species of the red sulphur bacteria are established. The three new genera are Thioderma, Thiosphærion, and Thiosphæra. Using Pfeffer's capillary method he obtained among others the following results with *Chromatium weissii*. It was powerfully attracted by the following substances: water containing various quantities of sulphide of hydrogen, 0.3% potassium nitrate, 0.3% ammonium nitrate, 0.3% ammonium phosphate, 0.5% ammonium tartrate, 0.3% potassium sodium tartrate, 0.3% monopotassium phosphate (neutralized by sodium carbonate). It was feebly attracted by 0.5% cane sugar, 0.5% grape sugar, 0.5% milk sugar, 0.5% asparagin. It was nearly indifferent to 0.5% glycerine, 0.3% magnesium sulphate, 0.3% ammonium chloride. It was strongly repelled by 0.5% malic acid. The organism also reacts to contact irritation. The temperature of the water in which these red bacteria grew was 23° to 35° C. An attractive lithographic plate accompanies the paper.

ERWIN F. SMITH.

Ripening of Cheese. — Persons who are fond of Roquefort, Camembert, and other piquant cheeses will be surprised to learn that fully one-half of the bulk of such cheeses, and often much more, consists of the mycelium and spores of fungi. These are not accidental impurities but necessary constituents, by means of which the various cheeses are ripened, and to which they owe their peculiar flavors. In reality, those who eat these appetizing cheeses consume

more fungus than cheese. The author of these statements is Dr. Olav Johan-Olsen,[1] the well-known mycologist, who will be remembered as joint author with Drs. Brefeld and Istvánffy of two large volumes on basidiomycetous fungi (Hefte vii and viii of Brefeld's *Untersuchungen*). For some years Dr. Johan-Olsen has been in charge of a royal Norwegian laboratory for the study of fermentations, and has had unlimited facilities for experimental cheese-making, and also good opportunities for studying the cheese industry in France and other parts of Europe. He has spent ten years in his efforts to discover exactly how to make cheeses of special brands, has used up more than 110,000 liters of milk, and has made thousands of microscopic examinations and special cultures, more than 500 different organisms having been isolated from a single variety of cheese. He now declares that his work has passed out of the experimental stage, and that he has discovered exactly how to make (by adding pure cultures of specified organisms to sterile or nearly sterile milk) well-known cheeses on a commercial scale. For example, one of the finest Norwegian cheeses is known as Gammelost. This cheese has a peculiar flavor, suggestive of apples, citron, and Camembert cheese, and always brings a good price. It is made by peasants in huts in the mountains, and there are so many uncertainties connected with its rule-of-thumb manufacture that only 10% of the product is first-class. By means of his pure-culture inoculations Dr. Johan-Olsen is now able to make this cheese on a large scale with a high degree of certainty, 90% of the product being first-class, without bad odor, with very fine flavor, and with better appearance and better keeping qualities than the same cheese as ordinarily made. No less than 15,000 kilos of this scientifically ripened cheese was produced last year. For a long time Dr. Johan-Olsen's experiments were barren of practical results, owing to his belief that the ripening of the cheese was due to bacteria. The abandonment of this hypothesis was followed by the discovery that the ripening and peculiar flavor of the most celebrated cheeses are due to the presence of fungi, and, what is still more interesting, to the joint action of several different sorts, one alone not being able to bring about the desired result. Until this symbiotic relationship was discovered he declares that hundreds and thousands of his cheese experiments miscarried, so that many of the cheeses had to be thrown away. In

[1] O. Johan-Olsen, Die bei der Käsereifung wirksamen Pilze, *Centralb. f. Bakt., Parasitenkunde, u. Infektionskr.*, Abt. ii, Bd. iv, No. 5, March 5, 1898, pp. 161–169.

case of the Gammelost the ripening and flavoring are accomplished by adding to the sour, coagulated skimmed milk two fungi, *viz.*, a Penicillium and a Mucor. The blue mold used is not *P. glaucum*, which always spoils the cheese when it gets into it, but a hitherto unrecognized species, *P. aromaticum*. In the green cheese, which is said to taste like sour horn, dead yeast and lactic acid organisms prevail; in the ripe cheese, which has an entirely different structure and appearance, Mucor and Penicillium are very abundant, Mucor being most abundant and exerting the predominant influence if the cheeses are ripened at high temperatures, and Penicillium if they are ripened at moderate temperatures.

We are not told what fungi should be used to ripen and flavor Gorgonzola, Roquefort, Camembert, and Norwegian cheese (goat cheese), but are given to understand that these problems have been solved, and also that he will soon be in condition to give exact directions for making Stilton, Gouda, Eidam, Cheddar, Emmetthaler, and other cheeses. The paper from which these statements have been taken is illustrated by six lithographic plates showing Gammelost and the fungi required to ripen and flavor it. ERWIN F. SMITH.

A New Check-List of North American Plants.[1] — At the Buffalo meeting of the American Association the botanists interested in the Rochester nomenclature decided to prepare a reform check-list of the higher plants of North America. This list, except in its greater territorial scope, was to be much like the one already issued for northeastern North America. The work, we believe, was to be assigned so far as possible to specialists, each of whom should treat only such groups as were most familiar to him. It is needless to say that many botanists have grave doubts as to the value of such a list. They see clearly that the Rochester nomenclature, instead of being an ideal system, has serious defects which will, as they believe, preclude its ultimate success. However, if such a list was to be prepared at all, there is reason to commend the coöperative plan adopted. The consistent application of any new principle of nomenclature to the flora of such a vast area is a matter of great and obvious difficulty, and it was the hope of the conservatives as well as the reformers that the work, if undertaken, might be carried out with caution and scholarly methods. For these reasons it is a matter for general regret that the proposed critical list has been anticipated

[1] Heller, A. A. *Catalogue of North American Plants North of Mexico, Exclusive of the Lower Cryptogams.* Minneapolis, March 10, 1898.